

## Claims:

- 1 A method for measuring loop resistance comprising:
- 5 injecting into the loop through an inductive injection probe a sinusoidal drive signal at a given frequency to produce a predetermined current in the loop;
- measuring, by a test probe also inductively coupled to the loop, the true RMS drive signal voltage and induced current; and
- 10 calculating the loop resistance from the measured RMS values.
- 2 A method according to claim 1, in which the given frequency is of the order of 1 kHz.
- 15 3 A method according to claim 1 or claim 2, in which the sinusoidal signal is generated by a microcontroller using a digital to analogue converter.
- 4 A method according to claim 3, in which the converter is configured to convert a microcontroller generated 0 – 10V signal to an output voltage in the range 0 200V.
- 20 5 A method according to claim 3 or claim 4, in which the output voltage is supplied to the injection probe through audio amplifier means.
- 25 6 A method according to any one of claims 1 to 5, in which drive signal voltage and induced current are measured using a multimeter arrangement.
- 7 A method according to any one of claims 1 to 6, in which current is measured across a burden resistor.
- 30 8 A method according to claim 7, in which the burden resistor has a value of 10Ω.
- 9 A method according to any one of claims 1 to 8, in which the injection and test probes have a turns ratio of 1000:1.
- 35 10 A method according to any one of claims 1 to 9, in which measurements are made to a resolution of 5½ digits or 21 bits.
- 11 A method according to any one of claims 1 to 10, in which the measured signals are digitally filtered to accept only the given frequency.
- 40 12 Apparatus for measuring loop resistance, comprising:
- 45 sinusoidal drive signal generating means generating a sinusoidal drive signal at a given frequency;

- an inductive injection probe adapted to inject said sinusoidal drive signal into the loop;
- an inductive test probe adapted to measure the true RMS drive signal voltage and induced current; and
- calculating means for calculating the loop resistance from the measured RMS values.
- 13 Apparatus according to claim 12, in which the drive signal generating means generates a drive signal above 200 Hz.
- 14 Apparatus according to 12 or claim 13, in which the drive signal generating means generates a drive signal at a frequency of the order of 1 kHz.
- 15 Apparatus according to any one of claims 12 to 14, in which the drive signal generating means comprise a microcontroller with a digital to analogue converter.
- 16 Apparatus according to claim 15, in which the digital to analogue converter is configured to convert a 0 – 10V signal to an output voltage in the range 0 – 200V.
- 17 Apparatus according to any one of claims 12 to 16, comprising audio amplifier means connected to supply the injection probe.
- 18 Apparatus according to any one of claims 12 to 17, incorporating a multimeter for measuring drive voltage and/or induced current.
- 19 Apparatus according to any one of claims 12 to 18, including a burden resistor across which induced current is measured.
- 20 Apparatus according to claim 19, in which the burden resistor has a value of 10Ω.
- 21 Apparatus according to any one of claims 12 to 20, in which the injection and test probes have a turns ratio of between 500:1 and 2000:1.
- 22 Apparatus according to claim 21, in which the injection and test probes have a turns ratio of 1000:1.
- 23 Apparatus according to any one of claims 12 to 22, comprising a digital filter to filter the signals to accept only the given frequency.
- 24 A method for providing a reference loop of accurately known resistance, comprising the steps of:
- making a loop of nominal resistance; and

- measuring the loop resistance by:
- making electrical contact with said loop at a first contact position;
- 5 making electrical contact with said loop at a second position approximately 180° around said loop; and
- measuring the resistance of said loop between the contacts;
- 10 altering the position of the second contact point until the measured resistance is a maximum, and;
- calculating the loop resistance to be four times the maximum measured resistance.
- 15 25 A method according to claim 24, in which the resistance is measured in a Wheatstone bridge arrangement.
- 20 26 A method according to claim 24 or claim 25, in which the loop has sub-loops facilitating fractional loop resistances.
- 27 A reference loop of accurately known loop resistance made by a method according to any one of claims 25 to 27.
- 25 28 A multi-value reference loop of known loop resistance having at least one sub-loop facilitating measurement of fractional loop resistance by providing more than one current path through an injection probe and/or a test probe.